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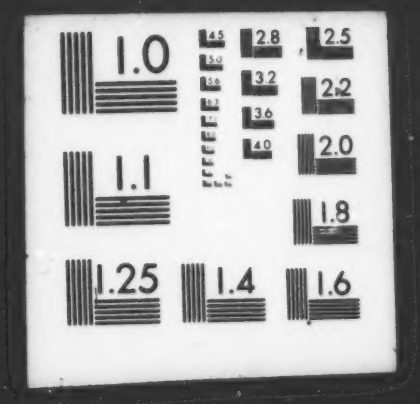

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PYMATUNING RESERVOIR CRAWFORD COUNTY, PENNSYLVANIA AND ASHTABULA COUNTY, OHIO

Pacific Northwest Environmental Research Laboratory

Prepared for:

National Environmental Research Center

June 1975

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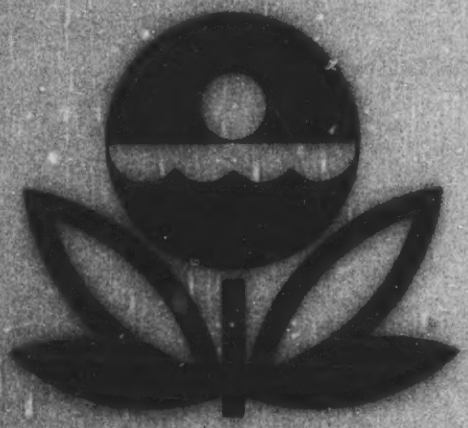

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REPORT
ON
PYMATUNING RESERVOIR
CRAWFORD COUNTY, PENNSYLVANIA
AND
ASHTABULA COUNTY, OHIO

EPA REGION III

WORKING PAPER No. 425

WITH THE COOPERATION OF THE

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES

AND THE

PENNSYLVANIA NATIONAL GUARD

JUNE, 1975

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16. ABSTRACT

Annual total phosphorus and total nitrogen loadings to the lake were estimated and subdivided according to either point or non-point source origin. An assessment of the lake's trophic condition and limiting nutrient is also provided. All data collected by the U.S.E.P.A. National Eutrophication Survey during the one year study of the lake and its tributaries are included in the report.

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CONTENTS

	Page
Foreword	ii
List of Pennsylvania Study Lakes	iv
Lake and Drainage Area Map	v
Sections	
I. Conclusions	1
II. Lake and Drainage Basin Characteristics	5
III. Lake Water Quality Summary	7
IV. Nutrient Loadings	12
V. Literature Reviewed	18
VI. Appendices	19

FOREWORD

The National Eutrophication Survey was initiated in 1972 in response to an Administration commitment to investigate the nationwide threat of accelerated eutrophication to fresh water lakes and reservoirs.

OBJECTIVES

The Survey was designed to develop, in conjunction with state environmental agencies, information on nutrient sources, concentrations, and impact on selected freshwater lakes as a basis for formulating comprehensive and coordinated national, regional, and state management practices relating to point-source discharge reduction and non-point source pollution abatement in lake watersheds.

ANALYTIC APPROACH

The mathematical and statistical procedures selected for the Survey's eutrophication analysis are based on related concepts that:

a. A generalized representation or model relating sources, concentrations, and impacts can be constructed.

b. By applying measurements of relevant parameters associated with lake degradation, the generalized model can be transformed into an operational representation of a lake, its drainage basin, and related nutrients.

c. With such a transformation, an assessment of the potential for eutrophication control can be made.

LAKE ANALYSIS

In this report, the first stage of evaluation of lake and watershed data collected from the study lake and its drainage basin is documented. The report is formatted to provide state environmental agencies with specific information for basin planning [§303(e)], water quality criteria/standards review [§303(c)], clean lakes [§314(a,b)], and water quality monitoring [§106 and §305(b)] activities mandated by the Federal Water Pollution Control Act Amendments of 1972.

Beyond the single lake analysis, broader based correlations between nutrient concentrations (and loading) and trophic condition are being made to advance the rationale and data base for refinement of nutrient water quality criteria for the Nation's fresh water lakes. Likewise, multivariate evaluations for the relationships between land use, nutrient export, and trophic condition, by lake class or use, are being developed to assist in the formulation of planning guidelines and policies by EPA and to augment plans implementation by the states.

ACKNOWLEDGMENT

The staff of the National Eutrophication Survey (Office of Research & Development, U. S. Environmental Protection Agency) expresses sincere appreciation to the Pennsylvania Department of Environmental Resources for professional involvement and to the Pennsylvania National Guard for conducting the tributary sampling phase of the Survey.

Walter A. Lyon, Director of the Bureau of Water Quality Management, Richard M. Boardman, Chief of the Division of Water Quality, and James T. Ulanoski, Aquatic Biologist of the Division of Water Quality, provided invaluable lake documentation and counsel during the Survey, reviewed the preliminary reports, and provided critiques most useful in the preparation of this Working Paper series.

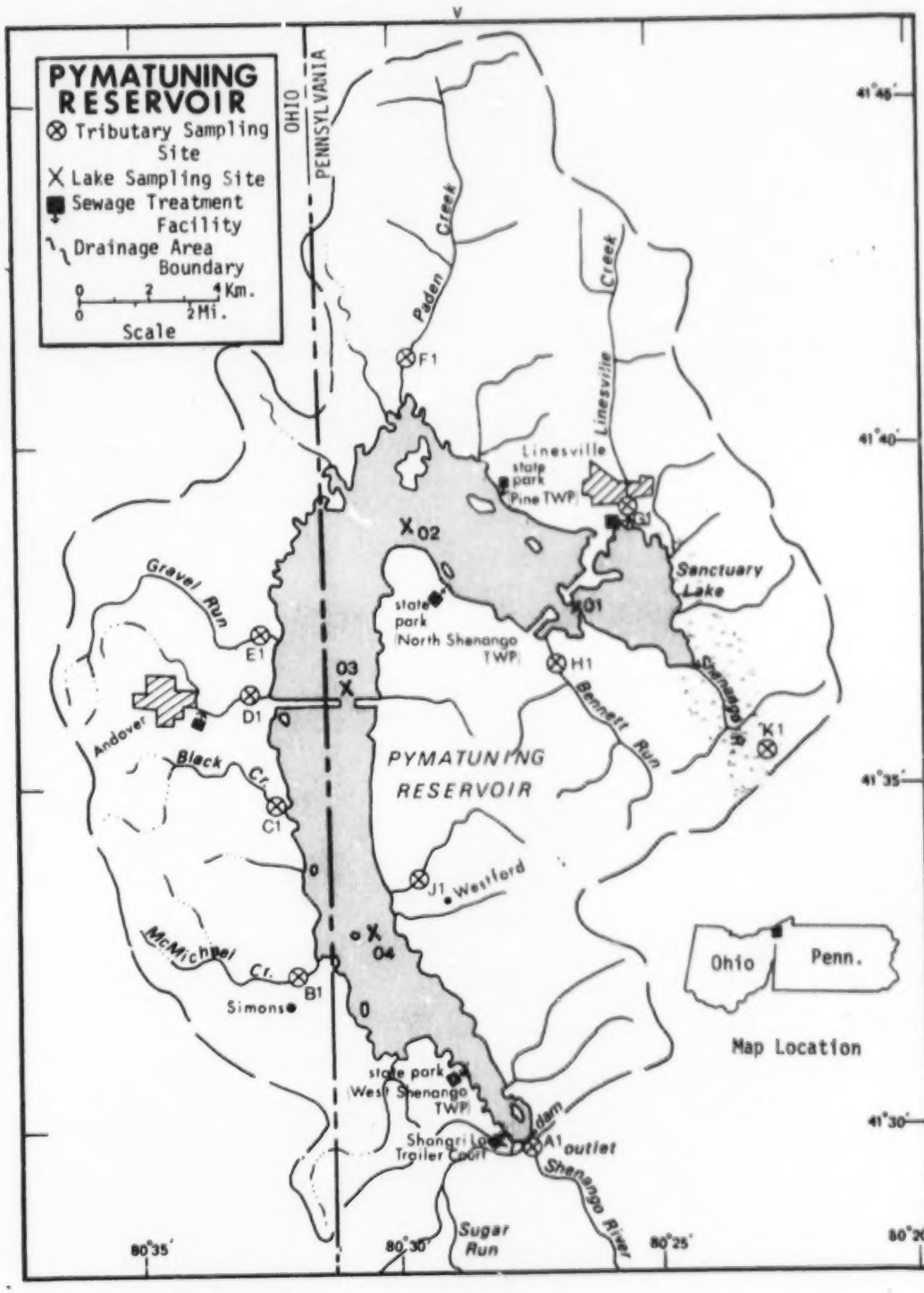
Major General Harry J. Mier, Jr., the Adjutant General of Pennsylvania, and Project Officer Major Ronald E. Wickard, who directed the volunteer efforts of the Pennsylvania National Guardsmen, are also gratefully acknowledged for their assistance to the Survey.

NATIONAL EUTROPHICATION SURVEY

STUDY LAKES

STATE OF PENNSYLVANIA

LAKE NAME	COUNTY
Allegheny Reservoir	McKean, Warren, PA; Cattaraugus, NY
Beaver Run Reservoir	Westmoreland
Beltzville	Carbon
Blanchard Reservoir	Centre
Canadohta	Crawford
Conneaut	Crawford
Conewago (Pinchot)	York
Greenlane	Montgomery
Harveys	Luzerne
Indian	Somerset
Naomi	Monroe
Ontelaunee	Berks
Pocono	Monroe
Pymatuning Reservoir	Crawford, PA; Ashtabula, OH
Shenango River Reservoir	Mercer
Stillwater	Monroe
Wallenpaupack	Pike, Wayne


PYMATUNING RESERVOIR
Tributary Sampling Site
Lake Sampling Site
Sewage Treatment Facility
Drainage Area Boundary
0 2 4 Km.
0 2 Mi.
Scale
OHIO
PENNSYLVANIA
Paden Creek
Linesville Creek
F1
Linesville state park
Pine TWP
X02
Sanctuary Lake
state park (North Shenango TWP)
X01
H1
Gravel Run
E1
03
X
D1
Andover
Bennett Run
Shenango R.
X1
Black Cr.
C1
PYMATUNING RESERVOIR
J1 Westford
McMichael Cr.
B1
Simons
X
04
Ohio
Penn.
Map Location
state park (West Shenango TWP)
Shangri La Trailer Court
Dam
A1 outlet
Shenango River
Sugar Run
41°45'
41°40'
41°35'
41°30'
80°35'
80°30'
80°25'
80°20'

PYMATUNING RESERVOIR*

STORET NO. 4213

I. CONCLUSIONS

A. Trophic Condition:

Survey data and a report by others (Ketelle and Uttormark, 1971) indicate that Pymatuning Reservoir is eutrophic. It ranked thirteenth in overall trophic quality when the 17 Pennsylvania lakes sampled in 1973 were compared using a combination of six lake parameters**. Sixteen of the lakes had less median total phosphorus, 11 had less and two had the same median dissolved phosphorus, four had less and one had the same median inorganic nitrogen, 16 had less mean chlorophyll a, and 15 had greater mean Secchi disc transparency.

Survey limnologists reported surface algae in protected areas as well as many submergent and emergent aquatic plants.

In a previous study, Tryon and Jackson (1952) considered Pymatuning Reservoir as three ecologically different lakes; i.e., Sanctuary Lake, "Middle Lake", and "Lower Lake", (see map, page v); and Survey data confirmed to confirm this. For example the mean chlorophyll a concentration at station A-1 in Sanctuary Lake was 100 µg/l, at station 2 in "Middle Lake" was 53 µg/l, and at station 4 in "Lower Lake" was 28 µg/l. Total phosphorus

* Table of metric conversions--Appendix A.
** See Appendix B.

dissolved phosphorus, total alkalinity, and Secchi disc transparencies showed similar patterns, but nitrogen did not. However, in this report, the reservoir is considered as one unit.

B. Rate-Limiting Nutrient:

The algal assay results show that Pymatuning Reservoir was phosphorus limited when the sample was collected (04/21/73). The lake data indicate phosphorus limitation in July as well but nitrogen limitation in October.

C. Nutrient Controllability:

1. Point sources--The phosphorus contributions of known point sources amounted to 21% of the total load reaching Pymatuning Reservoir during the sampling year. These sources include Linesville, Pennsylvania (10.5%), Andover, Ohio (8.6%), and three sewage treatment plants serving Pymatuning State Park which collectively contributed 1.5% of the total.

The estimated phosphorus loading rate of 0.23 $g/m^2/yr$ is only 1.4 times that proposed by Vollenweider (Vollenweider and Dillon, 1974) as an oligotrophic rate (see page 17). However, in view of the evidence of eutrophy in Pymatuning Reservoir, it is probable that the calculated loading rate is much too low and that unmeasured phosphorus inputs reached the

lake during the sampling year (e.g., wastes from mobile home parks just north of the mouth of McMichael Creek in Ohio).

Also, the Sanctuary Lake portion of the reservoir (see map, page v) serves as a State waterfowl refuge, and considerable numbers of resident and migratory ducks and geese utilize the reservoir. On the basis of the numbers provided by the Pennsylvania Department of Environmental Resources and certain assumptions (see page 13), it is estimated that wild ducks and geese contributed 3,415 kilograms of total phosphorus (22.0% of the total load) to the reservoir during the sampling year. While seemingly high, this estimate in fact may be too low. In their study of a small, 15-hectare lake in the W. T. Kellogg Bird Sanctuary in southwestern Michigan, Manny, Wetzel, and Johnson (1975) calculated that some 6,000 migrant Canada geese contribute 59 kilograms of phosphorus to the lake each year. On an areal basis, this amounts to 0.39 $g/m^2/yr$ as compared to the Pymatuning Reservoir estimate of 0.05 $g/m^2/yr$.

Because of the eutrophic condition of the lake and the likelihood that the actual phosphorus loading rate is much higher than estimated, all phosphorus inputs should be minimized to the greatest practicable degree to slow the cultural

aging of Pymatuning Reservoir as well as reduce the amount of phosphorus contributed via the outlet to downstream Shenango River Reservoir (Working Paper No. 426).

2. Non-point sources--It is estimated that 79% of the total phosphorus input to Pymatuning Reservoir was contributed by non-point sources during the sampling year. Ungaged tributaries were estimated to have contributed 15.8%, the unnamed creek D-1 contributed 14.0%, Linesville Creek contributed 8.0%, and Paden Creek contributed 4.8% of the total load. The seven remaining gaged tributaries collectively contributed a total of 7.0% of the load.

The phosphorus export rate of unnamed creek D-1 was a very high 247 kg/km^2/year (see page 17). This high rate and the low export N/P ratio indicate that either the load from the Andover, Ohio sewage treatment facility was underestimated, or additional point sources in the municipal area were impacting the stream.

The export rate of Linesville Creek was a somewhat high 49 kg/km^2/yr but probably was the result of urban drainage from the community of Linesville rather than point-source impact. Also, the export rate of unnamed creek J-1 was 46 kg/km^2/yr. However, considering the typical export N/P ratio of 30/1, it is likely that this export rate is the result of an underestimation of the drainage area of the stream.

II. LAKE AND DRAINAGE BASIN CHARACTERISTICS

A. Lake Morphometry†:

1. Surface area: 66.45 kilometers^2.
2. Mean depth: 3.7 meters.
3. Maximum depth: 7.6 meters.
4. Volume: 245.865 x 10^6 m^3.
5. Mean hydraulic retention time: 1.4 years (based on outlet flow).

B. Tributary and Outlet:
(See Appendix C for flow data)

1. Tributaries -

Name	Drainage area (km^2)*	Mean flow (m^3/sec)*
McMichael Creek	16.7	0.2
Black Creek	14.6	0.1
Unnamed Creek (D-1)	8.8	0.1
Gravel Run	14.0	0.1
Paden Creek	43.5	0.6
Linesville Creek	25.2	0.4
Bennett Run	18.1	0.2
Unnamed Creek (J-1)	2.7	0.1
Shenango River	?	0.2
Minor tributaries & immediate drainage -	188.9	3.3
Totals	332.5	5.3

2. Outlet -

Shenango River	398.9**	5.6

† Ulanoski, 1975.
* For limits of accuracy, see Working Paper No. 175, "...Survey Methods, 1973-1976".
** Includes area of lake.

C. Precipitation*:

1. Year of sampling: 111.0 centimeters.

2. Mean annual: 96.8 centimeters.

* See Working Paper No. 175.

III. LAKE WATER QUALITY SUMMARY

Pymatuning Reservoir was sampled three times during the open-water season of 1973 by means of a pontoon-equipped Huey helicopter. Each time, samples for physical and chemical parameters were collected from four stations on the lake and from a number of depths at each station (see map, page v). During each visit, a single depth-integrated (near bottom to surface) sample was composited from the stations for phytoplankton identification and enumeration; and during the first visit, a single 18.9-liter depth-integrated sample was composited for algal assays. Also each time, a depth-integrated sample was collected from each of the stations for chlorophyll a analysis. The maximum depths sampled were 2.4 meters at station 1, 3.4 meters at station 2, 3.0 meters at station 3, and 6.1 meters at station 4.

The lake sampling results are presented in full in Appendix D and are summarized in the following table.

A. SUMMARY OF PHYSICAL AND CHEMICAL CHARACTERISTICS FOR PYMATUNING RESERVOIR
STORET CODE 4213

PARAMETER	1ST SAMPLING (4/21/73) 4 SITES RANGE	MEAN	MEDIAN	2ND SAMPLING (7/31/73) 4 SITES RANGE	MEAN	MEDIAN	3RD SAMPLING (10/ 6/73) 4 SITES RANGE	MEAN	MEDIAN
TEMP (C)	11.5 - 17.4	13.6	12.7	23.9 - 25.3	24.4	24.4	17.8 - 18.8	18.4	18.4
DISS OXY (MG/L)	8.8 - 11.5	10.1	10.0	7.3 - 9.1	8.2	8.0	8.8 - 10.0	9.4	9.4
CNDCTVY (MCROMO)	150. - 190.	170.	170.	144. - 201.	153.	150.	126. - 136.	132.	133.
PH (STAND UNITS)	8.0 - 8.7	8.2	8.1	7.2 - 9.2	8.3	8.3	7.9 - 9.1	8.4	8.4
TOT ALK (MG/L)	31. - 39.	34.	32.	35. - 52.	40.	38.	32. - 49.	37.	35.
TOT P (MG/L)	0.024 - 0.112	0.043	0.031	0.050 - 0.159	0.086	0.078	0.070 - 0.490	0.141	0.090
ORTHO P (MG/L)	0.005 - 0.012	0.008	0.007	0.005 - 0.015	0.009	0.008	0.007 - 0.027	0.012	0.010
NO2+NO3 (MG/L)	0.040 - 0.460	0.285	0.270	0.050 - 0.150	0.091	0.090	0.020 - 0.100	0.043	0.030
AMMONIA (MG/L)	0.050 - 0.130	0.075	0.070	0.060 - 0.140	0.093	0.090	0.040 - 0.190	0.080	0.070
KJEL N (MG/L)	0.600 - 1.800	0.918	0.800	0.800 - 2.000	1.264	1.200	1.300 - 5.800	2.133	1.580
INORG N (MG/L)	0.100 - 0.530	0.360	0.370	0.110 - 0.290	0.184	0.180	0.060 - 0.280	0.123	0.100
TOTAL N (MG/L)	1.040 - 1.840	1.204	1.100	0.850 - 2.120	1.355	1.290	1.320 - 5.890	2.177	1.530
CHLRPYL A (UG/L)	7.7 - 61.4	28.0	21.5	43.1 - 105.6	70.6	66.8	34.5 - 132.9	70.4	57.1
SECCHI (METERS)	0.5 - 1.7	1.3	1.4	0.4 - 0.6	0.5	0.5	0.4 - 0.9	0.7	0.8

B. Biological characteristics:

1. Phytoplankton -

Sampling Date	Dominant Genera	Algal units per ml
04/21/73	1. Aphanizomenon (?)	6,168
	2. Flagellates	2,821
	3. Scenedesmus	640
	4. Cryptomonas	489
	5. Synedra	451
	Other genera	2,181
	Total	12,750
07/31/73	1. Lyngbya	7,724
	2. Stephanodiscus	1,657
	3. Nitzschia	1,330
	4. Anabaena	1,038
	5. Scenedesmus	1,005
	Other genera	3,571
	Total	16,325
10/06/73	1. Lyngbya	3,535
	2. Oscillatoria	1,964
	3. Anabaena	1,375
	4. Melosira	1,257
	5. Flagellates	1,257
	Other genera	5,422
	Total	14,810

2. Chlorophyll *a* -

Sampling Date	Station Number	Chlorophyll *a* (µg/l)
04/21/73	01	61.4
	02	25.2
	03	17.8
	04	7.7
07/31/73	01	105.6
	02	70.4
	03	63.2
	04	43.1
10/06/73	01	132.9
	02	62.5
	03	51.7
	04	34.5

C. Limiting Nutrient Study:

1. Autoclaved, filtered, and nutrient spiked -

Spike (mg/l)	Ortho P Conc. (mg/l)	Inorganic N Conc. (mg/l)	Maximum yield (mg/l- dry wt.)	N/P Ratio
Control	0.030	0.460	7.1	15/1
0.050 P	0.080	0.460	8.3	6/1
0.050 P + 1.0 N	0.080	1.460	15.4	18/1
1.0 N	0.030	1.460	6.9	49/1

2. Discussion -

The control yield of the assay alga, *Selenastrum capricornutum*, indicates that the potential primary productivity of Pymatuning Reservoir was high at the time the sample was collected. Also, the relatively small but significant increase in yield when only orthophosphorus was added indicates the reservoir was phosphorus limited at that time (note the

lack of significant change in yield when only nitrogen was added).

The relatively small increase in yield resulting from the orthophosphorus spike was due to the shift to nitrogen limitation when the excess phosphorus was added (note the change in the N/P ratio). The control sample would have become nitrogen limited with the addition of only about 0.004 mg/l of orthophosphorus, so about 0.046 mg/l of the 0.050 mg/l spike could not be utilized by the assay algae. Hence the small growth response to the phosphorus addition.

The lake data indicate phosphorus limitation in July also (the mean N/P ratio was 20/1) but nitrogen limitation in October (the mean N/P ratio was 10/1, and nitrogen limitation would be expected).

IV. NUTRIENT LOADINGS
(See Appendix E for data)

For the determination of nutrient loadings, the Pennsylvania National Guard collected monthly near-surface grab samples from each of the tributary sites indicated on the map (page v), except for the high runoff month of February when two samples were collected. Sampling was begun in May, 1973, and was completed in April, 1974.

Through an interagency agreement, stream flow estimates for the year of sampling and a "normalized" or average year were provided by the Pennsylvania District Office of the U.S. Geological Survey for the tributary sites nearest the lake.

Nutrient loads for sampled tributaries were determined by using a modification of a U.S. Geological Survey computer program for calculating stream loadings*. Nutrient loads shown are those measured minus point-source loads, if any.

Nutrient loads for unsampled "minor tributaries and immediate drainage" ("ZZ" of U.S.G.S.) were estimated using the means of the nutrient loads, in $kg/km^2/year$, at stations B-1, C-1, E-1, F-1, and H-1 and multiplying the means by the ZZ area in km^2.

The operator of the Linesville, PA, wastewater treatment plant provided monthly effluent samples and corresponding flow data. The operators of the wastewater treatment plants at Pymatuning State Park

* See Working Paper No. 175.

provided monthly effluent samples. However, corresponding flow data were not available for all sampling dates. The missing flows were estimated using the mean value of the flows that were taken. The total nutrient load was then adjusted to reflect a seasonal use of four months per year. The Shangri-La Trailer Court and Andover, Ohio, did not participate in the Survey, and nutrient loads were estimated at 1.134 kg P and 3.401 kg N/capita/year.

Estimates of nutrient contributions by wild ducks and geese were based on the following numbers of waterfowl using Pymatuning Reservoir as provided by the Pennsylvania Department of Environmental Resources (Ulanoski, 1975):

Summer resident ducks	7,500
Summer resident geese	2,500
Winter resident ducks	5,000
Winter resident geese	10,000
Migratory ducks	35,000
Migratory geese	20,000

In calculating the nutrient loads, the following assumptions were made:

1. Each wild duck contributes 0.45 kg total nitrogen and 0.20 kg total phosphorus per year (Paloumpis and Starrett, 1960).

2. Each wild goose contributes the same amount as one duck since geese typically feed in fields away from the lake several hours each day.

3. Summer or winter resident waterfowl are at the lake for six months of the year.

4. Migratory waterfowl spend a total of one month per year at the lake; i.e., 15 days during Spring migration and 15 days during Fall migration.

A. Waste Sources:

1. Known muncipal -

Name	Pop. Served	Treatment	Mean Flow (m^3/d)	Receiving Water
Linesville	1,265†	act. sludge	754.2	Linesville Creek
Shangri-La Trailer Court**	18	act. sludge + ponds	6.8*	Pymatuning Res.
State Park (N. Shenango Twp.)	variable	ext. aer.	12.6	Pymatuning Res.
State Park (W. Shenango Twp.)	variable	ext. aer.	51.7	Pymatuning Res.
State Park (Pine Twp.)	variable	ext. aer.	35.3	Pymatuning Res.
Andover, OH	1,179†	prim. clarifier	446.3*	Unnamed Stream (D-1)

2. Known industrial - None

† 1970 Census.
* Estimated at 0.3785 m^3/capita/day.
** Riggs, 1973.

B. Annual Total Phosphorus Loading - Average Year:

1. Inputs -

Source	kg P/ yr	% of total
a. Tributaries (non-point load) -		
McMichael Creek	175	1.1
Black Creek	140	0.9
Unnamed Creek (D-1)	2,170	14.0
Gravel Run	245	1.6
Paden Creek	745	4.8
Linesville Creek	1,245	8.0
Bennett Run	190	1.2
Unnamed Creek (J-1)	125	0.8
Shenango River	215	1.4
b. Minor tributaries & immediate drainage (non-point load) -	2,455	15.8
c. Known municipal STP's -		
Linesville	1,635	10.5
Shangri-La Trailer Court	20	0.1
State Park (N. Shenango Twp.)	35	0.2
State Park (W. Shenango Twp.)	160	1.0
State Park (Pine Twp.)	30	0.2
Andover, OH	1,335	8.6
d. Septic tanks* -	15	0.1
e. Known industrial - None	-	-
f. Wild ducks and geese -	3,415	22.0
g. Direct precipitation** -	1,165	7.5
Total	15,515	100.0

2. Outputs -

Lake outlet - Shenango River 7,675

3. Net annual P accumulation - 7,840 kg.

* Estimate based on 61 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

C. Annual Total Nitrogen Loading - Average Year:

1. Inputs -

Source	kg N/ yr	% of total
a. Tributaries (non-point load) -		
McMichael Creek	5,775	2.2
Black Creek	3,430	1.3
Unnamed Creek (D-1)	4,565	1.7
Gravel Run	6,265	2.3
Paden Creek	27,065	10.1
Linesville Creek	19,605	7.3
Bennett Run	13,070	4.9
Unnamed Creek (J-1)	3,700	1.4
Shenango River	6,065	2.3
b. Minor tributaries & immediate drainage (non-point load) -	89,650	33.5
c. Known municipal STP's -		
Linesville	2,270	0.8
Shangri-La Trailer Court	60	<0.1
State Park (N. Shenango Twp.)	235	0.1
State Park (W. Shenango Twp.)	1,100	0.4
State Park (Pine Twp.)	375	0.1
Andover, OH	4,010	1.5
d. Septic tanks* -	650	0.2
e. Known industrial - None	-	-
f. Wild ducks and geese -	7,690	2.8
g. Direct precipitation** -	71,740	26.8
Total	267,320	100.0

2. Outputs -

Lake outlet - Shenango River 203,450

3. Net annual N accumulation - 63,870 kg.

* Estimate based on 61 lakeshore dwellings; see Working Paper No. 175.
** See Working Paper No. 175.

D. Mean Annual Non-point Nutrient Export by Subdrainage Area:

Tributary	kg P/km²/yr	kg N/km²/yr	N/P ratio
McMichael Creek	10	346	35/1
Black Creek	10	235	24/1
Unnamed Creek (D-1)	247	519	2/1
Gravel Run	18	448	25/1
Paden Creek	17	622	37/1
Linesville Creek	49	778	16/1
Bennett Run	10	722	72/1
Unnamed Creek (J-1)	46	1,370	30/1

E. Yearly Loading Rates:

In the following table, the existing phosphorus loading rates are compared to those proposed by Vollenweider (Vollenweider and Dillon, 1974). Essentially, his "dangerous" rate is the rate at which the receiving water would become eutrophic or remain eutrophic; his "permissible" rate is that which would result in the receiving water remaining oligotrophic or becoming oligotrophic if morphometry permitted. A mesotrophic rate would be considered one between "dangerous" and "permissible".

Note that Vollenweider's model may not be applicable to water bodies with short hydraulic retention times.

	Total Phosphorus		Total Nitrogen	
	Total	Accumulated	Total	Accumulated
grams/m²/yr	0.23	0.12	4.0	1.0

Vollenweider loading rates for phosphorus (g/m²/yr) based on mean depth and mean hydraulic retention time of Pymatuning Reservoir:

"Dangerous" (eutrophic rate)	0.32
"Permissible" (oligotrophic rate)	0.16

V. LITERATURE REVIEWED

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VII. APPENDICES

APPENDIX A

CONVERSION FACTORS

CONVERSION FACTORS

Hectares x 2.471 = acres

Kilometers x 0.6214 = miles

Meters x 3.281 = feet

Cubic meters x 8.107×10^{-4} = acre/feet

Square kilometers x 0.3861 = square miles

Cubic meters/sec x 35.315 = cubic feet/sec

Centimeters x 0.3937 = inches

Kilograms x 2.205 = pounds

Kilograms/square kilometer x 5.711 = lbs/square mile

APPENDIX B

LAKE RANKINGS

LAKES RANKED BY INDEX NOS.

RANK	LAKE CODE	LAKE NAME	INDEX NO
1	4224	LAKE NAOMI	445
2	4220	BELTZVILLE DAM	423
3	4222	HARVEY'S LAKE	413
4	4228	STILLWATER LAKE	401
5	4227	POCONO LAKE	389
6	4223	INDIAN LAKE	388
7	3641	ALLEGHENY RESERVOIR	385
8	4229	LAKE WALLENPAUPACK	371
9	4221	CANADOHTA LAKE	369
10	4219	BEAVER RUN RESERVOIR	360
11	4204	CONNEAUT LAKE	307
12	4226	PINCHOT LAKE	256
13	4213	PYMATUNING RESERVOIR	206
14	4216	SHENANGO RIVER RESERVOIR	157
15	4225	ONTELAUNEE DAM	101
16	4201	BLANCHARD RESERVOIR	85
17	4207	GREENLANE DAM	53

PERCENT OF LAKES WITH HIGHER VALUES (NUMBER OF LAKES WITH HIGHER VALUES)

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS P	INDEX NO
3641	ALLEGHENY RESERVOIR	56 (9)	38 (6)	63 (10)	100 (16)	69 (11)	59 (8)	385
4201	BLANCHARD RESERVOIR	13 (2)	13 (2)	25 (4)	31 (5)	3 (0)	0 (0)	85
4204	CONNEAUT LAKE	44 (7)	63 (10)	69 (11)	56 (9)	34 (5)	41 (6)	307
4207	GREENLANE DAM	6 (1)	6 (1)	19 (3)	13 (2)	3 (0)	6 (1)	53
4213	PYMATUNING RESERVOIR	0 (0)	72 (11)	6 (1)	0 (0)	100 (16)	28 (4)	206
4216	SHENANGO RIVER RESERVOIR	19 (3)	44 (7)	13 (2)	6 (1)	47 (7)	28 (4)	157
4219	BEAVER RUN RESERVOIR	94 (15)	19 (3)	88 (14)	81 (13)	19 (2)	59 (8)	360
4220	BELTZVILLE DAM	88 (14)	25 (4)	94 (15)	94 (15)	34 (5)	88 (13)	423
4221	CANADOHTA LAKE	50 (8)	97 (15)	56 (9)	19 (3)	59 (9)	88 (13)	369
4222	HARVEY'S LAKE	63 (10)	81 (13)	100 (16)	63 (10)	47 (7)	59 (8)	413
4223	INDIAN LAKE	100 (16)	31 (5)	75 (12)	75 (12)	19 (2)	88 (13)	388
4224	LAKE NAOMI	81 (13)	88 (14)	44 (7)	69 (11)	88 (14)	75 (12)	445
4225	ONTELAUNEE DAM	25 (4)	0 (0)	0 (0)	44 (7)	19 (2)	13 (2)	101
4226	PINCHOT LAKE	31 (5)	56 (9)	31 (5)	38 (6)	81 (13)	19 (3)	256
4227	POCONO LAKE	38 (6)	97 (15)	50 (8)	88 (14)	75 (12)	41 (6)	389
4228	STILLWATER LAKE	72 (11)	72 (11)	38 (6)	25 (4)	94 (15)	100 (16)	401
4229	LAKE WALLENPAUPACK	72 (11)	50 (8)	81 (13)	50 (8)	59 (9)	59 (8)	371

LAKE DATA TO BE USED IN RANKINGS

LAKE CODE	LAKE NAME	MEDIAN TOTAL P	MEDIAN INORG N	500-MEAN SEC	MEAN CHLORA	15-MIN DO	MEDIAN DISS P
3641	ALLEGHENY RESERVOIR	0.016	0.380	414.250	3.700	13.800	0.006
4201	BLANCHARD RESERVOIR	0.064	1.300	453.143	15.187	14.900	0.046
4204	CONNEAUT LAKE	0.023	0.185	402.000	7.567	14.600	0.007
4207	GREENLANE DAM	0.066	1.475	460.222	24.011	14.900	0.020
4213	PYMATUNING RESERVOIR	0.070	0.180	467.750	56.333	7.700	0.008
4216	SHENANGO RIVER RESERVOIR	0.058	0.340	463.555	26.800	14.500	0.008
4219	BEAVER RUN RESERVOIR	0.009	0.835	384.833	5.183	14.800	0.006
4220	BELTZVILLE DAM	0.010	0.815	362.444	4.856	14.600	0.005
4221	CANADOHTA LAKE	0.020	0.130	436.000	19.167	14.100	0.005
4222	HARVEY'S LAKE	0.015	0.160	338.000	5.967	14.500	0.006
4223	INDIAN LAKE	0.008	0.520	400.222	5.211	14.800	0.005
4224	LAKE NAOMI	0.014	0.135	443.333	5.533	8.000	0.005
4225	ONTELAUNEE DAM	0.040	2.150	470.667	11.783	14.800	0.011
4226	PINCHOT LAKE	0.027	0.245	453.800	13.950	11.500	0.008
4227	POCONO LAKE	0.024	0.130	438.800	4.980	13.200	0.007
4228	STILLWATER LAKE	0.015	0.180	449.000	18.233	7.900	0.004
4229	LAKE WALLENPAUPACK	0.015	0.250	394.583	9.617	14.100	0.006

APPENDIX C

TRIBUTARY FLOW DATA

TRIBUTARY FLOW INFORMATION FOR PENNSYLVANIA 1/27/75

LAKE CODE 4213 PYMATUNING RESERVOIR

TOTAL DRAINAGE AREA OF LAKE(SQ KM) 398.9

TRIBUTARY	SUB-DRAINAGE AREA(SQ KM)	NORMALIZED FLOWS(CMS) JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
4213A1	398.9	6.14	7.02	7.62	5.49	4.25	4.28	5.10	5.88	7.67	5.38	3.62	4.87	5.60
4213B1	16.7	0.25	0.28	0.48	0.28	0.14	0.05	0.03	0.01	0.01	0.02	0.07	0.14	0.15
4213C1	14.6	0.11	0.13	0.25	0.13	0.05	0.01	0.01	0.00	0.00	0.01	0.02	0.05	0.06
4213D1	8.8	0.14	0.14	0.19	0.14	0.10	0.05	0.04	0.02	0.02	0.04	0.07	0.10	0.09
4213E1	14.0	0.20	0.22	0.31	0.22	0.13	0.06	0.04	0.02	0.02	0.04	0.08	0.14	0.12
4213F1	43.5	1.02	1.08	1.42	1.08	0.71	0.37	0.27	0.18	0.12	0.25	0.51	0.74	0.64
4213G1	25.2	0.57	0.59	0.76	0.59	0.42	0.27	0.21	0.14	0.11	0.19	0.34	0.45	0.39
4213H1	18.1	0.37	0.40	0.54	0.40	0.24	0.11	0.08	0.04	0.03	0.07	0.16	0.25	0.22
4213J1	2.7	0.12	0.13	0.18	0.13	0.08	0.04	0.03	0.02	0.01	0.02	0.05	0.08	0.07
4213K1	0.0	0.31	0.34	0.48	0.34	0.21	0.10	0.07	0.04	0.03	0.06	0.14	0.22	0.19
4213ZZ	251.2	5.24	5.64	7.84	5.64	3.57	1.81	1.30	0.79	0.59	1.19	2.46	3.71	3.30

SUMMARY

TOTAL DRAINAGE AREA OF LAKE = 398.9
SUM OF SUB-DRAINAGE AREAS = 394.8
TOTAL FLOW IN = 63.15
TOTAL FLOW OUT = 67.25

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4213A1	5	73	11.21	19	12.35				
	6	73	6.77	9	11.84				
	7	73	2.19	6	2.46				
	8	73	2.94	10	2.86				
	9	73	4.76	8	4.79				
	10	73	4.87	6	4.87				
	11	73	5.04	3	5.01				
	12	73	5.52	7	4.96				
	1	74	11.19	5	7.93				
	2	74	12.66	2	11.86				
	3	74	4.98	21	4.39				
	4	74	9.63	20	13.79				
421301	5	73	0.27	19	0.06				
	6	73	0.11	9	0.09				
	7	73	0.02	6	0.03				
	8	73	0.02	10	0.00				
	9	73	0.00	8	0.00				
	10	73	0.01	6	0.02				
	11	73	0.08	3	0.19				
	12	73	0.23	7	0.03				
	1	74	0.42	5	0.06				
	2	74	0.12	2	0.11				
	3	74	0.85	21	0.23				
	4	74	0.34	20	0.11				

TRIBUTARY FLOW INFORMATION FOR PENNSYLVANIA 1/27/75

LAKE CODE 4213 PYMATUNING RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4213C1	5	73	0.13	19	0.02				
	6	73	0.04	9	0.03				
	7	73	0.00	6	0.01				
	8	73	0.00	10	0.0				
	9	73	0.0	8	0.0				
	10	73	0.00	6	0.00				
	11	73	0.03	3	0.08				
	12	73	0.10	7	0.01				
	1	74	0.24	5	0.02				
	2	74	0.05	2	0.04				
	3	74	0.57	21	0.10				
	4	74	0.17	20	0.04				
421301	5	73	0.14	19	0.06				
	6	73	0.09	9	0.08				
	7	73	0.03	6	0.04				
	8	73	0.03	10	0.01				
	9	73	0.01	8	0.02				
	10	73	0.03	6	0.03				
	11	73	0.07	3	0.12				
	12	73	0.13	7	0.05				
	1	74	0.18	5	0.07				
	2	74	0.09	2	0.09				
	3	74	0.26	21	0.13				
	4	74	0.16	20	0.09				
4213E1	5	73	0.22	19	0.07				
	6	73	0.11	9	0.10				
	7	73	0.03	6	0.05				
	8	73	0.03	10	0.01				
	9	73	0.01	8	0.01				
	10	73	0.03	6	0.03				
	11	73	0.09	3	0.17				
	12	73	0.19	7	0.05				
	1	74	0.28	5	0.08				
	2	74	0.12	2	0.10				
	3	74	0.48	21	0.19				
	4	74	0.26	20	0.12				
4213F1	5	73	1.05	19	0.42				
	6	73	0.62	9	0.59				
	7	73	0.20	6	0.26				
	8	73	0.23	10	0.07				
	9	73	0.09	8	0.09				
	10	73	0.20	6	0.22				
	11	73	0.51	3	0.85				
	12	73	0.96	7	0.31				
	1	74	1.39	5	0.45				
	2	74	0.68	2	0.62				
	3	74	2.01	21	0.96				
	4	74	1.22	20	0.65				

TRIBUTARY FLOW INFORMATION FOR PENNSYLVANIA 1/27/75

LAKE CODE 4213 MYMATUNING RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4213G1	5	73	0.59	19	0.28				
	6	73	0.40	9	0.37				
	7	73	0.16	6	0.22				
	8	73	0.18	10	0.07				
	9	73	0.08	8	0.09				
	10	73	0.16	6	0.18				
	11	73	0.34	3	0.48				
	12	73	0.57	7	0.24				
	1	74	0.74	5	0.31				
	2	74	0.42	2	0.40				
	3	74	0.49	21	0.54				
	4	74	0.64	26	0.40				
4213M1	5	73	0.40	19	0.13				
	6	73	0.21	9	0.19				
	7	73	0.05	6	0.08				
	8	73	0.06	10	0.02				
	9	73	0.02	8	0.02				
	10	73	0.05	6	0.06				
	11	73	0.16	3	0.28				
	12	73	0.34	7	0.09				
	1	74	0.51	5	0.14				
	2	74	0.22	2	0.21				
	3	74	0.82	21	0.34				
	4	74	0.45	20	0.21				
4213J1	5	73	0.13	19	0.05				
	6	73	0.07	9	0.07				
	7	73	0.02	6	0.03				
	8	73	0.02	10	0.01				
	9	73	0.01	8	0.01				
	10	73	0.02	6	0.02				
	11	73	0.06	3	0.10				
	12	73	0.11	7	0.03				
	1	74	0.17	5	0.05				
	2	74	0.08	2	0.07				
	3	74	0.26	21	0.11				
	4	74	0.15	20	0.07				
4213K1	5	73	0.34	19	0.12				
	6	73	0.14	9	0.16				
	7	73	0.05	6	0.07				
	8	73	0.05	10	0.01				
	9	73	0.02	8	0.02				
	10	73	0.05	6	0.05				
	11	73	0.14	3	0.26				
	12	73	0.24	7	0.08				
	1	74	0.45	5	0.12				
	2	74	0.20	2	0.18				
	3	74	0.71	21	0.28				
	4	74	0.40	13	0.19				

TRIBUTARY FLOW INFORMATION FOR PENNSYLVANIA 1/27/75

LAKE CODE 4213 PYMATUNING RESERVOIR

MEAN MONTHLY FLOWS AND DAILY FLOWS(CMS)

TRIBUTARY	MONTH	YEAR	MEAN FLOW	DAY	FLOW	DAY	FLOW	DAY	FLOW
4213ZZ	5	73	5.55	19	2.07				
	6	73	3.11	9	2.89				
	7	73	0.96	6	1.39				
	8	73	1.08	10	0.34				
	9	73	0.42	8	0.45				
	10	73	0.93	6	1.05				
	11	73	2.49	3	4.30				
	12	73	4.96	7	1.53				
	1	74	7.45	5	2.21				
	2	74	3.37	2	3.09				
	3	74	11.84	21	4.90				
	4	74	6.51	20	3.20				

29.

APPENDIX D

PHYSICAL and CHEMICAL DATA

STORET RETRIEVAL DATE 75/01/27

421301
41 37 45.0 080 26 22.0
PYMATUNING RESERVOIR
42039 PENNSYLVANIA

11EPALES
3

2111202
0010 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/21	11 00	0000	17.4		18	150	8.70	39	0.060	1.800	0.040	0.009
	11 00	0008	16.9	11.5		190	8.50	38	0.060	1.500	0.080	0.010
73/07/31	14 10	0000	24.6		17	152	8.90	52	0.120	2.000	0.120	0.008
	14 10	0005	24.4	7.5		201	7.70	49	0.140	1.800	0.150	0.010
73/10/06	16 00	0000	18.8		14	132	9.10	49	0.130	2.900	0.100	0.019
	16 00	0005	18.4	9.0		135	8.00	45	0.190	5.800	0.090	0.027

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/21	11 00	0000	0.063	61.4
	11 00	0008	0.112	
73/07/31	14 10	0000	0.154	105.6
	14 10	0005	0.159	
73/10/06	16 00	0000	0.186	132.9
	16 00	0005	0.490	

31

STORET RETRIEVAL DATE 75/01/27

421302
41 38 55.0 080 29 27.0
PYMATUNING RESERVOIR
42039 PENNSYLVANIA

11EPALES
3

2111202
0013 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/21	11 25	0000	14.6		48	160	8.60	35	0.050	0.900	0.200	0.007
	11 25	0011	14.4	11.4		160	8.60	34	0.130	0.900	0.180	0.007
73/07/31	13 45	0000	25.3		20	150	9.20	38	0.110	1.400	0.130	0.008
	13 45	0005	24.4	8.9		148	8.60	39	0.090	1.100	0.090	0.015
	13 45	0010	24.3	8.0		148	8.30	37	0.100	1.200	0.090	0.009
73/10/06	16 15	0000	18.6		28	126	8.80	35	0.080	2.000	0.040	0.011
	16 15	0005	18.4	10.0		127	8.40	33	0.050	1.700	0.030	0.008

32.

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/21	11 25	0000	0.048	25.2
	11 25	0011	0.048	
73/07/31	13 45	0000	0.081	70.4
	13 45	0005	0.085	
	13 45	0010	0.091	
73/10/06	16 15	0000	0.104	62.5
	16 15	0005	0.108	

STORET RETRIEVAL DATE 75/01/27

421303
41 36 28.0 080 30 39.0
PYMATUNING RESERVOIR
42039 PENNSYLVANIA

11EPALES
3 .

2111202
0014 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/21	14 00	0000	12.3		66	170	8.10	37	0.060	0.800	0.260	0.005
	14 00	0004	12.7	8.8		170	8.10	31	0.080	0.800	0.300	0.012
	14 00	0010	11.7	9.5		160	8.00	32	0.100	0.800	0.270	0.009
73/07/31	13 20	0000	24.5		20	144	8.90	38	0.090	1.200	0.080	0.009
	13 20	0005	24.2	9.1		146	8.50	36	0.090	1.200	0.090	0.007
	13 20	0010	23.9	7.8		145	7.60	35	0.080	1.200	0.090	0.006
73/10/06	16 25	0000	18.8		32	133	8.70	34	0.070	1.400	0.030	0.010
	16 25	0005	17.8	10.0		130	8.30	32	0.050	1.500	0.030	0.010

33.

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/21	14 00	0000	0.027	17.8
	14 00	0004	0.036	
	14 00	0010	0.031	
73/07/31	13 20	0000	0.070	63.2
	13 20	0005	0.077	
	13 20	0010	0.078	
73/10/06	16 25	0000	0.073	51.7
	16 25	0005	0.090	

STORET RETRIEVAL DATE 75/01/27

421304
41 33 00.0 080 30 36.0
PYMATUNING RESERVOIR
42039 PENNSYLVANIA

11EPALES
3

2111202
0025 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00010 WATER TEMP CENT	00300 DO MG/L	00077 TRANSP SECCHI INCHES	00094 CNDUCTVY FIELD MICROMHO	00400 PH SU	00410 T ALK CACO3 MG/L	00610 NH3-N TOTAL MG/L	00625 TOT KJEL N MG/L	00630 NO2&NO3 N-TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P
73/04/21	14 30	0000	12.7		66	175	8.00	32	0.060	0.600	0.440	0.006
	14 30	0004	12.7	10.6		180	8.00	31	0.070	0.600	0.460	0.007
	14 30	0015	12.4	10.0		180	8.00	31	0.070	0.700	0.460	0.006
	14 30	0020	11.5	9.0		180	8.00	31	0.080	0.700	0.450	0.005
73/07/31	11 10	0000	24.7		24	152	8.30	39	0.070	1.100	0.060	0.005
	11 10	0005	24.4	8.5		152	7.80	38	0.060	0.800	0.050	0.006
	11 10	0015	24.1	7.3		150	7.20	41	0.070	0.900	0.050	0.011
73/10/06	16 40	0000	18.8		34	136	8.40	35	0.070	1.300	0.030	0.007
	16 40	0005	18.2	9.4		135	8.00	36	0.040	1.300	0.020	0.007
	16 40	0014	18.1	8.8		135	7.90	34	0.040	1.300	0.020	0.008

34

DATE FROM TO	TIME OF DAY	DEPTH FEET	00665 PHOS-TOT MG/L P	32217 CHLRPHYL A UG/L
73/04/21	14 30	0000	0.024	7.7
	14 30	0004	0.027	
	14 30	0015	0.026	
	14 30	0020	0.028	
73/07/31	11 10	0000	0.050	43.1
	11 10	0005	0.050	
	11 10	0015	0.052	
73/10/06	16 40	0000	0.070	34.5
	16 40	0005	0.070	
	16 40	0014	0.076	

APPENDIX E

TRIBUTARY and WASTEWATER TREATMENT PLANT DATA

STORET RETRIEVAL DATE 75/02/03

4213A1
41 29 50.0 080 27 12.0
SHENANGO RIVER
42091 7.5 W GREENVILLE
O/PYMATUNING RES
BANK NEAR DAM AND ABOV CON WITH SUGAR RU
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	11 40		0.378	0.910	0.126	0.011	0.050
73/06/09	13 00		0.370	1.200	0.089	0.011	0.030
73/07/06	11 55		0.190	1.000	0.132	0.011	0.045
73/08/11	13 15		0.013	0.840	0.059	0.005K	0.065
73/09/08	13 05		0.010K	1.050	0.027	0.019	0.055
73/10/20	12 15		0.010K	0.850	0.046	0.014	0.070
73/11/04	11 15		0.028	0.500	0.056	0.008	0.065
73/12/16	09 00		0.072	0.300	0.054	0.008	0.015
74/01/05	10 00		1.180	0.900	0.044	0.005K	0.020
74/02/03	09 00		0.340	1.100	0.150	0.005K	0.030
74/02/18	09 00		0.320	0.700	0.145	0.005K	0.025
74/03/02	09 00		0.528	0.900	0.210	0.020	0.035
74/04/20	09 00		0.420	0.900	0.025	0.010	0.045

36.

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

421361
41 32 28.0 080 32 02.0
MCMICHAEL CREEK
42 7.5 ANDOVER
T/PYMATUNING RES
PYMATUNING LK RD BRDG .5 MI N OF SIMONS
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	12 45		0.420	0.940	0.025	0.018	0.050
73/06/09	13 20		0.960	0.840	0.034	0.037	0.060
73/07/06	12 35		0.294	0.740	0.039	0.022	0.055
73/08/11	13 35		0.115	0.760	0.036	0.016	0.055
73/09/08	13 25		0.010K	0.940	0.031	0.022	0.035
73/10/20	12 30		0.019	0.475	0.021	0.011	0.020
73/11/04	11 00		0.036	0.850	0.068	0.044	0.095
73/12/16	09 30		1.180	0.600	0.040	0.012	0.035
74/01/05	10 45		1.180	0.400	0.034	0.005K	0.020
74/02/03	09 30		0.680	0.500	0.035	0.015	0.045
74/02/18	09 30		0.630	0.500	0.045	0.010	0.055
74/03/02	09 30		9.600	0.700	0.030	0.010	0.035
74/04/20	09 30		0.520	0.450	0.025	0.017	0.052

37.

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

4213C1
41 34 40.0 080 32 05.0
BLACK CREEK
42 7.5 ANDOVER
T/PYMATUNING RES
PYMATUNING LK RD BRDG .4 S JCT GIBBS RD
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	13 25		0.250	0.660	0.039	0.020	0.040
73/06/09	13 35		0.357	1.050	0.068	0.032	0.065
73/07/06	12 45		0.105	0.935	0.072	0.026	0.065
73/08/11	13 50		0.056	3.400	0.067	0.072	0.330
73/09/08	13 35		0.010K	1.350	0.310	0.021	0.085
73/10/20	12 30		0.012	0.800	0.037	0.012	0.090
73/11/04	10 45		1.800	1.000	0.044	0.012	0.075
73/12/16	09 45		1.090	0.400	0.036	0.015	0.025
74/01/05	11 00		1.440	0.800	0.040	0.008	0.015
74/02/03	09 45		0.670	1.000	0.135	0.055	0.095
74/02/18	09 45		0.630	0.700	0.135	0.055	0.115
74/03/02	09 45		0.820	0.200	0.095	0.025	0.070
74/04/20	09 45		0.216	0.500	0.040	0.015	0.045

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

421301
41 36 28.0 080 32 45.0
UNNAMED CREEK
42 7.5 ANDOVER
T/PYMATUNING RES
PYMATUNING LK RD BRDG 1.2 E OF ANDOVER
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	13 50		1.520	0.960	0.066	0.560	0.650
73/06/09	13 45		2.040	1.390	0.210	0.790	0.960
73/07/06	12 55		4.900	1.200	0.072	2.000	2.300
73/08/11	14 00		3.300	0.945	0.063	2.700	2.700
73/09/08	13 45		5.700	1.050	0.077	3.500	3.880
73/10/20	13 00		1.500	1.150	0.410	4.200	4.200
73/11/04	10 30		1.260	1.300	0.276	0.645	0.780
73/12/16	10 15		1.440	0.700	0.116	0.900	0.930
74/01/05	11 45		0.660	0.800	0.132	0.008	0.025
74/02/03	11 15		1.300	0.575	0.010	0.005K	0.030
74/02/18	10 15		1.200	0.500	0.025	0.005K	0.040
74/03/02	10 25		0.980	1.100	0.260	0.200	0.290
74/04/20	10 15		0.480	1.200	0.610	0.575	0.610

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

4213E1
41 37 25.0 080 32 33.0
GRAVEL RUN
42 7.5 ANDOVER
T/PYMATUNING RES
PYMATUNING LK RD BRDG 1 N JCT FENKELL RD
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/14	14 10		0.270	0.890	0.015	0.016	0.065
73/06/09	13 50		0.115	1.050	0.062	0.019	0.085
73/07/06	13 00		0.330	1.260	0.038	0.046	0.090
73/08/11	15 15		0.120	1.000	0.080	0.038	0.110
73/09/08	13 50		0.280	1.050	0.074	0.031	0.095
73/10/20	13 30		0.310	1.450	0.154	0.024	0.067
73/11/04	10 20		1.600	0.600	0.060	0.016	0.105
73/12/16	10 45		1.120	0.700	0.088	0.020	0.060
74/01/05	11 30		1.120	0.400	0.040	0.008	0.015
74/02/03	10 45		1.340	0.500	0.020	0.005K	0.030
74/02/18	10 45		1.260	0.500	0.012	0.005K	0.040
74/03/02	10 45		1.200	0.800	0.100	0.030	0.055
74/04/20	10 45		0.288	0.600	0.035	0.015	0.085

40.

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

4213F1
41 41 27.0 080 29 28.0
PADEN CREEK
42 7.5 LINESVILLE
T/PYMATUNING RES
US HWY 6 BRDG NEAR JCT WITH HALL RD
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	14 40		0.470	0.480	0.009	0.008	0.020
73/06/09	14 10		0.680	0.760	0.026	0.017	0.045
73/07/06	13 20		0.740	0.830	0.033	0.028	0.045
73/08/11	15 30		0.290	1.400	0.056	0.023	0.090
73/09/08	14 15		0.500	0.860	0.063	0.032	0.060
73/10/20	14 00		0.010K	0.900	0.025	0.013	0.025
73/11/04	10 00		0.830	0.450	0.024	0.012	0.075
73/12/15	10 00		0.910	0.200	0.028	0.012	0.012
74/01/05	14 00		1.430	0.400	0.040	0.008	0.015
74/02/03	11 00		0.580	1.000	0.025	0.005K	0.030
74/02/18	11 00		0.560	0.400	0.020	0.005K	0.045
74/03/02	12 00		0.900	0.500	0.035	0.015	0.020
74/04/20	11 00		0.550	0.300	0.017	0.012	0.030

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

421361
41 39 00.0 080 25 10.0
LINESVILLE CREEK
42 7.5 LINESVILLE
T/PYMATUNING RES
US HWY 6 BRDG IN LINESVILLE
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	15	20	1.020	0.830	0.100	0.231	0.343
73/06/09	14	25	1.300	0.900	0.200	0.360	0.420
73/07/06	13	35	1.200	0.690	0.022	0.017	0.060
73/08/11	16	00	1.000	0.290	0.115	0.034	0.065
73/09/08	14	45	0.830	0.440	0.027	0.019	0.025
73/10/20	14	45	0.280	1.000	0.069	0.115	0.130
73/11/05	15	30	0.148	0.250	0.012	0.012	0.060
73/12/16	11	20	1.120	1.150	0.112	0.016	0.050
74/01/05	14	15	1.430	0.400	0.028	0.008	0.010
74/02/03	11	20	0.980	0.600	0.045	0.005	0.040
74/02/18	11	20	0.940	0.700	0.165	0.005K	0.055
74/03/02	13	30	1.260	0.500	0.020	0.015	0.025
74/04/20	11	20	0.924	0.300	0.025	0.020	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

4213M1
41 30 44.0 080 26 30.0
BENNETT RUN
42 7.5 MANTSTOWN
T/PYMATUNING RES
SEC RD BRDG 1 MI NE OF N SHENANGO
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	16	10	0.820	0.780	0.039	0.012	0.020
73/06/09	10	20	1.100	0.630	0.039	0.024	0.035
73/07/06	10	27	1.720	0.880	0.052	0.025	0.035
73/08/11	10	40	2.200	0.340	0.033	0.012	0.035
73/09/08	10	45	2.000	1.150	0.049	0.014	0.025
73/10/20	11	00	0.950	0.400	0.025	0.013	0.020
73/11/04	09	45	0.890	0.650	0.020	0.012	0.070
73/12/16	11	40	1.500	0.200	0.024	0.012	0.015
74/01/05	14	45	1.440	0.300	0.076	0.005K	0.010
74/02/03	11	40	0.820	0.800	0.025	0.005K	0.020
74/02/18	11	00	0.780	0.600	0.055	0.005K	0.030
74/03/02	11	40	0.960	0.410	0.040	0.030	0.050
74/04/20	11	40	0.860	0.200	0.015	0.010	0.020

113

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

421331
41 33 40.0 080 29 40.0
UNNAMED CREEK
42 7.5 HARTSTOWN
T/PYMATUNING RES
SEC RD BRDG .8 MI NW OF WESTFORD
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	11 05		0.050	0.660	0.011	0.010	0.045
73/06/09	12 30		0.069	1.100	0.038	0.016	0.065
73/07/06	11 25		0.270	1.200	0.060	0.027	0.080
73/08/11	12 50		0.198	0.960	0.044	0.025	0.065
73/09/08	12 40		0.680	0.820	0.036	0.029	0.050
73/10/20	11 45		0.740	0.700	0.018	0.007	0.030
73/11/04	12 30		1.920	0.750	0.032	0.016	0.103
74/01/05	15 00		1.180	0.800	0.072	0.005K	0.010
74/02/03	13 30		0.910	0.800	0.050	0.005K	0.020
74/02/18	13 30		0.870	0.500	0.045	0.005K	0.030
74/03/02	11 30		1.360	1.200	0.160	0.045	0.210
74/04/20	13 30		0.260	0.500	0.020	0.010	0.010

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

4213K1
41 34 20.0 080 22 15.0
SHENANGO R.(CROOKED CR)
42 7.5 HARTSTOWN
T/PYMATUNING RES
EMERGENCY RD BRDG 1.5 NNE OF HARRISTOWN
11EPALES 2111204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P
73/05/19	17 00		0.015	0.705	0.006	0.006	0.035
73/06/09	11 20		0.014	0.520	0.024	0.005K	0.020
73/07/06	10 58		0.014	0.780	0.022	0.009	0.045
73/08/11	11 20		0.017	5.400	0.113	0.008	0.080
73/09/08	13 30		0.015	0.960	0.018	0.008	0.045
73/10/20	15 30		0.280	1.080	0.090	0.009	0.060
73/11/04	13 30		0.012	0.950	0.048	0.005K	0.055
73/12/16	14 00		1.500	0.200	0.016	0.012	0.025
74/01/05	15 30		1.440	0.300	0.040	0.005K	0.010
74/02/03	14 00		0.160	0.500	0.040	0.005K	0.010
74/02/18	14 00		0.168	0.300	0.035	0.005K	0.020
74/03/02	14 00		0.276	0.400	0.070	0.010	0.010
74/04/20	12 00		0.036	0.900	0.075	0.045	0.085

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/10

421331
41 37 53.0 080 28 50.0
PYMATUNING STATE PARK (N SHENAN)
42 7.5 LINESVILLE
O/PYMATUNING RESERVOIR
PYMATUNING RESERVOIR
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
74/07/27	13 00		45.000	24.000	15.000	6.950	8.700		
74/08/07	08 30		26.400	15.000	9.500	5.700	6.300	0.010	0.010
74/08/21	08 00		21.000	16.000	8.300	6.300	7.600		
74/09/04	08 00			18.500	14.000	5.100	5.500		
74/09/18	08 00		51.500	15.300	10.000	8.800	10.150		
74/10/02	08 00		36.000	5.600		8.600	9.100		
74/10/16	08 00		46.000	3.100	0.140	5.650	6.100		

STORET RETRIEVAL DATE 75/02/10

421341 EA421341 P000615
41 32 30.0 080 28 45.0
PYMATUNING STATE PARK (W SHENANG
42 7.5 LINESVILLE
O/PYMATUNING RESERVOIR
PYMATUNING RESERVOIR
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
-73/07/12	11 00								
CP(T)- 73/07/12	15 00					5.100	8.200	0.040	0.40
-73/08/17	11 00								
CP(T)- 73/08/17	15 00		47.000		0.105	8.400	8.400	0.040	0.040
-74/05/11	11 00								
CP(T)- 74/05/11	16 00		19.300	1.000K	0.170	3.600	3.900	0.002	0.002
-74/07/25	11 00								
CP(T)- 74/07/25	15 00		67.000	5.500	0.210	8.100	8.600	0.044	0.044
74/08/07	12 00		66.500	2.300	0.260	8.100	8.100	0.040	
74/08/13	11 00								
CP(T)- 74/08/13	14 30		67.000	1.700	0.120	7.950	8.800	0.044	0.044
-74/08/21	12 00		21.000	0.800	0.130	8.300	8.700	0.044	0.044
-74/09/04	12 00		57.600	1.000K	0.290	7.600	8.900	0.040	
-74/09/18	12 00		52.000	0.940	0.190	6.900	7.400	0.040	

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

421351 EA421351 P000431
41 32 30.0 080 28 45.0
PYMATUNING STATE PARK (PINE)
42 7.5 LINESVILLE
0/PYMATUNING RESERVOIR
PYMATUNING RESERVOIR
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/07/04	11 00								
CP(T)-			41.000	0.300	0.056	2.200	2.300	0.028	0.028
73/07/04	15 00								
73/08/04	11 00								
CP(T)-			17.900		0.120	2.600	3.000	0.028	0.028
73/08/04	15 00								
73/09/03	11 00								
CP(T)-						2.240	2.300	0.028	0.028
73/09/03	15 00								
74/07/27	13 30		27.600	2.200	0.050	2.400	2.400		
74/08/07	09 30		32.000	1.000K	0.120	2.500	2.500	0.020	0.020
74/08/21	09 30		21.000	1.000	0.050K	2.900	3.150		
74/09/04	09 30		19.200	0.500K	0.050	1.500	1.600		

84

K VALUE KNOWN TO BE
LESS THAN INDICATED

STORET RETRIEVAL DATE 75/02/03

42136A AS42136A P001200
41 39 18.0 080 25 15.0
LINESVILLE MUNICPAL AUTHORITY
42 7.5 EAST GREENVI
T/PYMATUNING RESERVOIR
LINESVILLE CREEK
11EPALES 2141204
4 0000 FEET DEPTH

DATE FROM TO	TIME OF DAY	DEPTH FEET	00630 NO2&NO3 N-TOTAL MG/L	00625 TOT KJEL N MG/L	00610 NH3-N TOTAL MG/L	00671 PHOS-DIS ORTHO MG/L P	00665 PHOS-TOT MG/L P	50051 FLOW RATE INST MGD	50053 CONDUIT FLOW-MGD MONTHLY
73/06/18	13 15		5.300	6.800	0.017	6.756	7.800	0.139	0.168
73/07/18	10 30		17.400	0.100K	0.074	9.400	10.000	0.098	0.107
73/08/20	10 00				0.154	9.300	9.450	0.094	0.098
73/09/19	10 30		9.400	0.750	0.060	8.240	8.800	0.081	0.090
73/10/19	10 30		0.198	6.200	0.053	6.050	6.550	0.090	0.100
73/11/19	10 30		4.300	1.200	0.062	4.950	5.100	0.139	0.133
73/12/19	13 00		2.880	1.800	0.150	5.520	5.900	0.119	0.107
74/01/18	10 30		4.500	3.200	0.430	4.900	5.000	0.170	0.130
74/02/18	10 30		2.240	5.400	0.410	4.800	5.450	0.124	0.148
74/03/18	10 00		1.040	2.700	0.280	2.800	3.100	0.227	0.209
74/04/25	09 30		0.200	7.200	0.260	3.100	3.600	0.140	0.200
74/05/23	10 00		1.440	10.000	0.050K	4.100	4.900	0.119	0.200
74/06/25	10 00		2.400	3.800	0.005K	7.100	7.600	0.160	0.900

K VALUE KNOWN TO BE
LESS THAN INDICATED